high wind raised dense clouds of sand which nearly obscured the sun.

Abilene, Texas: during the 18th fresh southwest winds prevailed, increasing in force at night, and accompanied by heavy clouds of sand and dust. On the 19th a southwesterly gale set in, filling the atmosphere with sand to such an extent that the sun could not be seen until two hours after sunrise, and throughout the remainder of the day the sky was obscured to an altitude of 45° above the horizon. High winds, with heavy clouds of sand and dust, occurred also on the 7th, 16th, 19th, 25th, and 29th.

Sand storms also occurred at the following stations:
Rio Grande City, Texas, 17th, 19th, 20th, 21st, 23d, 27th.
Midland, Texas, 7th, 12th, 16th, 20th, 22d, 25th, 30th.
Corsicana, Texas, 19th.
Keeler, California, 27th.

SUN SPOTS.

Mr. H. Gowey, of North Lewisburg, Champaign county, Ohio, reports having observed sun spots on the 3d, 22d, 24th, and 29th.

M. A. Veeder, M. D., of Lyons, New York, gives the following observations in regard to points of the character indicated by him in the MONTHLY WEATHER REVIEW for October, 1886, on page 296:

On January 10th the ship "Constance" was struck by lightning, in latitude 40° north, longitude 68° west; and on that and the following day earthquake tremors were felt at Summerville, South Carolina, in West Virginia, and at San Francisco. The suspended magnet, as observed at Lyons, New York, at once acquired an average deflection of about a degree and a half westward, the daily range of movement from the point thus established being less than a quarter of a degree. This continued until February 1st, when a very active solar disturbance came into view by rotation, and unusual electrical storms occurred in the Ohio Valley and eastward, continuing from February 1st to February 4th, and was followed by earthquake shocks in Indiana on the 6th. On February 1st the range of movement of the magnet increased, until on the 5th it was a degree and a half, the magnet then returning for the first time to the position it had occupied previous to January 11th.

VERIFICATIONS.

INDICATIONS.

The predictions for January, 1887, were made by 2d Lieutenant F. M. M. Beall, Signal Corps, U. S. Army, Assistant, and were verified by 2d Lieutenant Frank Greene, Signal Corps, U. S. Army, Assistant.

The detailed comparison of the tri-daily indications for January, 1887, with the telegraphic reports of the twenty-four hours for which the indications were prepared, shows the general average percentage of verifications to be 73.63. The percentages for the different elements are: Weather, 72.20; wind, 70.26; temperature, 76.25. By states, etc., the percentages are: For Maine, 69.68; New Hampshire, 70.40; Vermont, 67.18; Massachusetts, 70.27; Rhode Island, 67.68; Connecticut, 70.81; New York, 72.69; Pennsylvania, 73.17; New Jersey, 77.63; Delaware, 74.60; Maryland, 76.50; District of Columbia, 73.71; Virginia, 73.61; North Carolina, 78.28; South Carolina, 78.15; Georgia, 81.32; Florida, 75.60; Alabama, 76.53; Mississippi, 72.03; Louisiana, 72.02; Texas, 73.71; Arkansas, 74.25; Tennessee, 75.00; Kentucky, 74.09; Ohio, 71.91; West Virginia, 63.84; Indiana, 74.19; Illinois, 76.37; Michigan, 75.19; Wisconsin, 72.61; Minnesota, 77.18; Iowa, 75.59; Kansas, 74.38; Nebraska, 70.97; Missouri, 79.27; Colorado, 63.47; east Dakota, 68.77.

There were seventeen omissions to predict, out of 9,951, or 0.17 per cent. Of the 9,934 predictions that have been made, eight hundred and eighty-eight, or 8.94 per cent., are considered to have entirely failed; six hundred and forty six, or 6.50 per cent., were one-fourth verified; 1,809, or 18.21 per cent., were one-half verified; 1,661, or 16.72 per cent., were three-fourths verified; 4,930, or 49.63 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Below are given for the Pacific coast the percentages of indications verified for December, 1886; this data was received too late for publication in the REVIEW of that date. The predictions were made by 2d Lieutenant W. A. Glassford, Signal Corps, U. S. Army, Assistant; they were verified by 2d Lieutenant F. M. M. Beall, Signal Corps, U. S. Army, Assistant. The percentages for the different districts are: Washington Territory, 76.89; Oregon, 68.15; northern California, 78.05; southern California, 82.15.

CAUTIONARY SIGNALS.

Of the total number of signals ordered during January, 1887, it was practical to determine the verifications of one hundred and fifty-two; of these, one hundred and thirty-three, or 87.50 per cent., were fully verified both as to direction and velocity. Number of signals ordered for northeast winds, one; verified, none. Number of signals ordered for southwest winds, twenty-one; fully verified both as to direction and velocity, twenty, or 95.24 per cent. Number of signals ordered for northwest winds, ninety-nine; fully verified both as to direction and velocity, eighty-six, or 86.87 per cent. Number of signals ordered for winds without regard to direction, thirty-one; verified, twenty-seven, or 87.10 per cent. Number of signals ordered late, *i. e.*, after the verifying velocity had begun, eighteen, or 11.84 per cent.

In addition to the above, three hundred and forty-one signals were ordered at display stations, the verifications of which it was impracticable to determine.

In forty-one instances winds were reported which would have justified the display of cautionary signals, but for which no signals were ordered, and in four instances winds which would have justified the display of on-shore signals, but for which no signals were ordered.

COLD-WAVE SIGNALS.

Total number of cold-wave signals ordered, the verifications of which were determined, was two hundred and seventy-six; verified, two hundred, or 72.10 per cent. Seventy-two signals were ordered, the verifications of which it was impracticable to determine. In addition to the above, in twelve hundred and sixty-seven instances, the signals ordered from this office were repeated by the observers at the regular stations to towns in their vicinity. The verifications of these it was impracticable to determine.

RAILWAY WEATHER SIGNALS.

P. H. Mell, jr., director of the "Alabama Weather Service," in the report for January, 1887, states:

The verification of predictions for the whole area was 71 per cent. for temperature, and 83.4 per cent. for weather.

The following corporations comprise this system: South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia system in Alabama; Memphis and Charleston; Columbus and Western; Atlanta and West Point of Georgia; Northeastern of Georgia; Western and Atlantic; East Tennessee, Virginia and Georgia system in Georgia; Montgomery and Eufaula; Pensacola and Selma; Pensacola and Atlantic; the cities of Milledgeville, Georgia, and Talladega, Alabama.

The following is from the "Bulletin of the New England Meteorological Society" for January, 1887:

Verification of weather signals at New Haven was 83.9 per cent. for temperature, 80.6 for weather.

SUMMARY FOR THE YEAR 1886.

In the accompanying table are given for Signal Service stations the normal annual temperatures, as deduced from observations covering periods of from six to sixteen years; the mean temperature of the year 1886 with the departures from the normal; the maximum and minimum temperature of 1886 with the dates of occurrence; the normal yearly precipitation for each station; the total precipitation of 1886 and the departures from the normal.

The mean temperature of the year 1886 is exhibited by the dotted isothermal lines on chart vii; on the same chart are also shown, by the heavy unbroken line, the region in which the mean temperature of the year 1886 coincides with the normal, and, by the light unbroken lines, the departures, either above or below. The total precipitation of the year 1886 is shown on chart viii; in addition to the reports from Signal

Service stations, data from the reports of all voluntary observers and stations of the different state weather services having complete records for the year have been used in preparing this chart.

An examination of chart vii will show that the mean temperature of the year 1886 is below the normal in all districts east of the Mississippi River, and in Arkansas, Louisiana, and eastern Texas; within this area four stations only have a mean temperature greater than the normal, viz., Mount Washington, New Hampshire; Chicago, Illinois; Detroit and Mackinaw City, Michigan. The temperature of the year is especially low in Florida and the south Atlantic and east Gulf states; in these districts the departures range from 3°.3 at Cedar Keys, Florida, and Nashville, Tennessee, to 0°.8 at Palestine, Texas.

The mean temperature of the year 1886 is below the normal at every Signal Service station south of the thirty-eighth parallel and east of the one hundredth meridian. To the westward of the Mississippi River, except in Arkansas, Louisiana, and eastern Texas, the mean temperature of the year is generally normal or slightly above, the greater departures occurring in Dakota and Montana, where they average only 1°.2, and range from 2°.1 at Fort Maginnis, Montana, and Deadwood, Dakota, to 0°.3 at Huron, Dakota. In southern California, southern Arizona, southern New Mexico, and at the stations of Sacramento, California, Winnemucca, Nevada, and Santa Fé, New Mexico, the temperature is slightly below the normal.

The precipitation of the year is below the normal at nearly all Signal Service stations, except those situated in Rhode Island, Connecticut, southern New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, eastern Tennessee, eastern Kentucky, and southern Ohio; at all stations in these states and parts of states an excess of precipitation occurs, except at New Haven, Connecticut, Philadelphia, Pennsylvania, and Cape Henry, Virginia. In Maryland, the District of Columbia, and in the mountainous districts of the states of Virginia, West Virginia, and North Carolina, the excess is over nine inches; at Washington City; it is nearly fifteen inches.

In Iowa, southeastern Minnesota, southwestern Wisconsin, northern Illinois, northern Indiana, northern Missouri, northeastern Kansas, and southeastern Nebraska, the precipitation of the year is more than ten inches below the normal; at Leavenworth, Kansas, the deficiency is 17.05 inches; at Omaha, Nebraska, it is 13.80 inches. During January, February, and March the rainfall of this area was about normal; in April it was below the normal, except in central Iowa; in May, June, and July the rainfall was very small, producing a disastrous drought, the effects of which were felt throughout the remainder of the year, especially in Iowa, where the rainfall was less than two-thirds of the normal amount, and the least observed during many years.

In northeastern and central Texas, southern and western Louisiana, southern Mississippi, southwestern Alabama, and the southwestern part of the Indian Territory the rainfall of the year is also over ten inches below the normal. This drought was especially severe in central Texas, and inflicted large losses on the agricultural and cattle interests. The deficiency in the cotton districts of the south Atlantic and east Gulf states is due to the light rainfalls of September and October. The drought in this section began in August and extended through October, covering a longer period than the drought in the same section two years previous. The deficiency in rainfall occurring as it did, after the cotton plant had about completed its growth, allowed the bolls to open rapidly under the warming influence of the sun's rays, and the farmer was enabled to secure this crop in an unstained condition. While this drought resulted favorably to the cotton crop it proved injurious to crops which had not developed before the drought set in, and especially was its influence felt in the preparation of market gardens and the planting of fall crops.

Extreme temperatures and comparison of the mean temperature and total rainfall of the year 1886, with the normal.

Station.	Temperature.							Precipitation.		
				Extremes for 1886.						
	Normal.	Mean for 1886.	Departure.	Maximum.	Date.	Minimum.	Date.	Normal.	Total for 1886.	Departure.
New England.	°	°	°	°		°		*Ins.*	*Ins.*	*Ins.*
Portland	46.7	44.1	—2.6	94.2	July 7	—12.4	Jan. 13	39.75	51.63	+11.88
Mount Washington	26.0	27.2	+1.2	68.9	Aug. 27	—39.2	Feb. 27	84.68	67.52	—17.16
Boston	48.2	48.1	—0.1	95.4	July 6	—10.1	Jan. 12	48.07	42.14	— 5.93
Block Island	49.4	49.1	—0.3	80.0	July 3 / Aug. 12	— 1.0	Feb. 5	51.86	54.52	+ 2.66
New Haven	49.7	48.2	—1.5	90.3	July 7	— 7.7	Feb. 5	49.89	48.32	— 1.57
New London	49.3	49.1	—0.2	88.0	July 7	— 4.2	Feb. 6	48.74	58.86	+10.12
Mid. Atlantic states.										
Albany	48.2	47.7	—0.5	97.0	July 6	—10.7	Feb. 5	37.82	34.01	— 3.81
New York City	51.2	51.0	—0.2	90.5	July 7	— 1.8	Feb. 5	43.48	46.73	+ 3.25
Atlantic City	51.9	51.4	—0.5	86.5	Aug. 2	— 2.3	Feb. 5	42.83	44.80	+ 1.97
Philadelphia	53.1	53.0	—0.1	93.8	July 30	— 2.4	Feb. 5	40.62	37.24	— 3.38
Baltimore	55.5	53.5	—2.0	92.2	July 7	— 1.1	Feb. 5	42.51	52.11	+ 9.60
Washington City	54.9	53.4	—1.5	92.0	Aug. 27	— 2.3	Feb. 5	43.47	58.17	+14.70
Chincoteague	54.8	54.5	—0.3	87.9	July 10	— 2.4	Feb. 5	39.15	45.23	+ 6.08
Cape Henry	58.8	57.0	—1.8	93.8	June 17	5.4	Feb. 5	54.65	44.62	—10.03
Norfolk	59.2	56.9	—2.3	93.2	June 17	3.5	Feb. 5	51.06	54.33	+ 3.27
Lynchburg	57.2	54.9	—2.3	94.6	July 30	— 2.7	Jan. 13	42.84	51.85	+ 9.01
South Atlantic states.										
Hatteras	61.5	60.2	—1.3	86.0	July 29, 30, 31	13.0	Feb. 5	73.95	54.72	—19.23
Fort Macon	62.1	60.9	—1.2	87.5	July 31	9.9	Jan. 11	59.80	47.50	—12.30
Wilmington	63.2	61.9	—1.3	94.5	July 28	10.0	Feb. 5	57.79	56.43	— 1.36
Charlotte	60.3	58.1	—2.2	93.7	July 28	— 0.6	Jan. 12	54.71	64.60	+ 9.89
Augusta	64.3	61.4	—2.9	100.6	Aug. 15	6.0	Jan. 12	48.97	46.04	— 2.93
Charleston	65.9	63.7	—2.2	94.0	May 15	10.5	Jan. 11	60.44	35.94	—24.50
Savannah	66.8	65.3	—1.5	93.2	June 17 / Aug. 1	12.0	Jan. 12	54.11	42.68	—11.43
Jacksonville	69.2	67.3	—1.9	94.3	June 28	15.3	Jan. 12	57.22	54.86	— 2.36
Florida Peninsula.										
Sanford	70.5	68.7	—1.8	94.7	June 11	21.0	Jan. 10	49.33	64.77	+15.44
Cedar Keys	70.7	67.4	—3.3	92.7	Aug. 18	15.5	Jan. 10	58.26	50.54	— 7.72
Key West	77.5	*75.9	—1.6	100.0*	Aug. 4	*40.8	Jan. 12	39.71	30.13	— 9.58
East Gulf states.										
Atlanta	61.3	58.9	— 2.4	94.0	Aug. 15,16	— 2.4	Jan. 11	56.36	50.78	— 5.58
Montgomery	65.4	63.3	—2.1	97.8	Aug. 19	5.4	Jan. 9	53.68	56.25	+ 2.57
Pensacola	68.0	66.1	—1.9	95.6	Aug. 15	14.9	Jan. 9	67.90	62.15	— 5.75
Mobile	66.9	64.4	—2.5	97.0	Aug. 15	11.0	Jan. 9	65.83	54.25	—11.58
Vicksburg	65.6	63.3	—2.3	96.3	Aug. 18	3.1	Jan. 9	60.87	55.89	— 4.98
New Orleans	69.1	66.1	—3.0	94.7	Aug. 16	15.3	Jan. 9	64.35	54.83	— 9.52
West Gulf states.										
Fort Smith	59.0	58.0	—1.0	104.5	Aug. 18	— 6.9	Jan. 8	42.96	35.33	— 7.63
Little Rock	62.1	58.9	—3.2	97.8	Aug. 17,18	— 4.8	Jan. 8	56.26	47.47	— 8.79
Shreveport	65.5	63.9	—1.6	101.2	May 31	1.3	Jan. 9	54.43	44.21	—10.22
Palestine	64.5	63.7	—0.8	98.2	Aug. 15	0.0	Jan. 8	45.98	33.21	—12.77
Galveston	70.1	68.1	—2.0	94.4	Aug. 23	11.0	Jan. 8	53.03	40.98	—12.05
San Antonio	69.1	66.6	—2.5	102.6	July 18	5.8	Jan. 8	32.52	26.22	— 6.30
Rio Grande Valley.										
Rio Grande City	73.3	72.8	—0.5	106.3	June 19	21.0	Jan. 9	23.02	20.11	— 2.91
Brownsville	72.6	70.5	—2.1	98.1	Aug. 7	22.5	Jan. 9	32.89	60.06	+27.17
Tennessee.										
Nashville	59.5	56.2	—3.3	97.7	Aug. 17	— 9.0	Jan. 11	52.90	44.74	— 8.16
Memphis	61.0	58.9	—2.1	97.8	Aug. 17	— 8.0	Jan. 9	54.76	57.72	+ 2.96
Chattanooga	60.0	57.3	—2.7	97.4	Aug. 17	— 6.9	Jan. 11	59.38	58.53	— 0.85
Knoxville	57.2	56.1	—1.1	94.4	July 29	— 6.0	Jan. 11	53.93	61.45	+ 7.52
Ohio Valley.										
Pittsburg	51.9	51.9	0.0	95.8	July 7	— 4.8	Jan. 12	36.67	39.21	+ 2.54
Columbus	52.1	50.4	—1.7	93.1	July 7	—10.8	Jan. 11	42.34	42.39	+ 0.05
Indianapolis	52.8	51.0	—1.8	94.8	July 29	—15.0	Jan. 10	46.47	39.88	— 6.59
Cincinnati	55.6	52.5	—3.1	94.7	July 29	—12.4	Jan. 11	43.09	31.35	—11.74
Louisville	56.7	54.9	—1.8	96.7	July 29	— 7.5	Jan. 11	48.90	40.97	— 7.93
Lower Lake region.										
Detroit	48.1	48.9	+0.8	92.0	July 29	— 3.5	Jan. 11	34.33	24.91	— 9.42
Toledo	50.0	47.7	—2.3	95.5	July 29	—11.4	Jan. 11	32.77	32.70	— 0.07
Sandusky	50.4	48.5	—1.9	95.8	July 29	—12.0	Jan. 11	39.54	31.00	— 8.54
Cleveland	48.8	48.2	—0.6	92.0	July 29	— 9.0	Jan. 11	38.16	27.34	—10.82
Erie	49.1	47.1	—2.0	90.5	July 29	—11.3	Feb. 5	43.46	37.49	— 5.97
Buffalo	46.4	45.9	—0.5	86.7	July 4	—12.1	Feb. 5	38.08	44.85	+ 6.77
Rochester	46.7	45.5	—1.2	91.4	Aug. 29	— 5.7	Feb. 5	36.17	36.84	+ 0.67
Oswego	47.1	44.5	—2.6	89.0	Aug. 29	—17.2	Jan. 12	35.53	35.46	— 0.07
Upper Lake region.										
Duluth	39.5	37.7	—1.8	94.0	July 5	—31.7	Jan. 23	33.09	33.37	+ 0.28
Marquette	40.7	37.7	—3.0	97.7	Aug. 9	—17.8	Jan. 23	33.00	29.27	— 3.73
Escanaba	40.2	39.7	—0.5	86.3	June 29	—21.7	Jan. 24	35.28	32.36	— 2.92
Milwaukee	44.8	44.0	—0.8	97.5	July 28	—21.8	Jan. 23	33.64	31.46	— 2.18
Chicago	48.5	49.0	+0.5	94 5	July 6	—14.4	Jan. 23	37.84	26.77	—11.07
Grand Haven	46.6	44.9	—1.7	87.0	July 5	—14.6	Feb. 3	39.54	35.31	— 4.23
Mackinaw City	39.3	41.5	+2.2	92.5	Aug. 9	—19.0	Feb. 4	36.37	23.39	—12.98
Alpena	40.9	40.5	—0.4	98.2	July 6	—23.0	Feb. 5	37.73	40.12	+ 2.39
Port Huron	44.9	44.3	—0.6	91.3	July 6	—13.0	Feb. 5	34.57	29.84	— 4.73
Extreme Northwest.										
Fort Buford	38.5	40.1	+1.6	105.9	July 12	—48.2	Jan. 22	14.76	10.24	— 4.52
Bismarck	39.4	40.0	+0.6	104.4	Aug. 24	—36.9	Jan. 22	20.72	13.26	— 7.46
Moorhead	36.7	37.6	+0.9	100.1	Aug. 24	—37.0	Feb. 2	27.91	26.76	— 1.15
Saint Vincent	33.2	35.0	+1.8	103.2	Aug. 24	—40.7	Jan. 9	18.85	15.04	— 3.81
Upper Miss. Valley.										
Saint Paul	43.8	42.6	—1.2	94.2	Aug. 12	—33.9	Jan. 23	29.26	22.89	— 6.37
LaCrosse	46.5	46.9	+0.4	95.5	July 5	—28.0	Feb. 3	34.07	22.49	—11.58
Dubuque	47.8	46.9	—0.9	100.4	July 6	—23.5	Dec. 27	39.78	27.51	—12.27
Davenport	49.3	48.2	—1.1	97.6	July 6	—21.8	Dec. 27	36.00	23.15	—12.85
Des Moines	48.4	49.3	+0.9	104.4	July 6	—24.0	Jan. 9	41.39	29.53	—11.86
Keokuk	51.6	50.5	—1.1	99.1	Aug. 12	—18.7	Jan. 9	37.91	29.66	— 8.25
Springfield	52.6	53.0	+0.4	99.4	Aug. 16	—12.9	Jan. 9	46.04	31.69	—14.35
Saint Louis	55.3	56.4	+1.1	102.0	Aug. 16	— 8.2	Jan. 9	38.31	44.34	+ 6.03
Cairo	58.0	55.4	—2.6	97.0	Aug. 17	— 9.0	Jan. 9	45.69	37.98	— 7.71

Extreme temperatures and comparison, etc.—Continued.

Stations.	Temperature.							Precipitation.		
	Normal.	Mean for 1886.	Departure.	Extremes for 1886. Maximum.	Date.	Minimum.	Date.	Normal.	Total for 1886	Departure.
Missouri Valley.	°	°	°	°		°		*Ins.*	*Ins.*	*Ins.*
Yankton	45.5	45.4	—0.1	102.7	July 13	—27.5	Jan. 9	28.37	29.15	+ 0.78
Huron	41.8	42.1	+0.3	103.6	July 12	—32.5	Jan. 9	24.50	20.25	— 4.25
Omaha	49.5	48.2	—1.3	100.0	July 13	—24.1	Jan. 9	36.47	22.67	—13.80
Leavenworth	53.1	52.4	—0.7	106.8	Aug. 16	—20.5	Jan. 9	39.30	22.25	—17.05
Northern slope.										
Fort Assinaboine	41.3	43.1	+1.8	108.4	July 12	—49.3	Jan. 22	14.17	11.48	— 2.69
Helena	43.2	43.6	+0.4	103.1	July 12	—30.2	Jan. 7	15.38	12.63	— 2.75
Fort Custer	44.1	44.8	+0.7	106.0	July 15	—38.3	Jan. 17	13.94	13.25	— 0.69
Fort Maginnis	40.4	42.5	+2.1	104.0	July 12	—33.2	Jan. 21, 29	12.08	15.44	+ 3.36
Deadwood	41.6	43.7	+2.1	96.0	July 10	—23.7	Jan. 7	26.45	25.97	— 0.48
North Platte	47.6	48.2	+0.6	102.4	July 15	—21.2	Jan. 8	19.57	13.10	— 6.47
Middle slope.										
Denver	49.2	49.3	+0.1	96.3	July 15	—18.9	Jan. 8	15.06	16.07	+ 1.01
Pike's Peak	19.1	19.8	+0.7	57.3	Oct. 1	—29.8	Jan. 7	29.65	29.51	— 0.14
Dodge City	52.7	52.5	—0.2	100.2	July 1 5	—16.2	Jan. 8	21.35	19.35	— 2.00
Las Animas	49.5	49.6	+0.1	104.4	July 3	—21.5	Jan. 8	13.62	12.78	— 0.84
Fort Elliott	54.6	56.0	+1.4	101.7	July 16	— 9.6	Jan. 8	24.59	21.65	— 2.94
Southern slope.										
Fort Sill	60.2	60.0	—0.2	106.0	July 16	— 5.0	Jan. 8	33.33	19.57	—13.76
Fort Davis	60.0	61.0	+1.0	101.7	July 18	— 3.2	Jan. 8	19.50	12.64	— 6.86
Southern plateau.										
Prescott	52.2	52.4	+0.2	96.1	July 7	— 2.0	Nov. 23	15.38	18.78	+ 3.40
Fort Grant	60.1	59.6	—0.5	99.6	July 14	12.1	Jan. 3	16.15	19.32	— 2.23
Fort Thomas	61.5	62.1	+0.6	108.2	Aug. 9	12.4	Jan. 3	11.96	10.86	— 1.10
Fort Apache	52.3	53.8	+1.5	100.6	June 30	— 9.5	Jan. 3	22.69	21.06	— 1.63
El Paso	63.2	63.1	—0.1	111.5	July 22	11.0	Jan. 8	12.31	8.06	— 4.25
Santa Fé	47.9	47.6	—0.3	93.0	July 18	— 6.5	Jan. 8	13.97	15.90	+ 1.93
Yuma	71.9	71.6	—0.3	112.4	July 13	30.4	Jan. 6	2.54	5.35	+ 2.81
Middle plateau.										
Salt Lake City	51.2	51.6	+0.4	99.1	Aug. 11	— 2.0	Jan. 8	17.22	18.89	+ 1.67
Winnemucca	49.4	49.1	—0.3	100.2	July 11	0.6	Nov. 16	9.98	8.16	— 1.82
Northern plateau.										
Spokane Falls	47.3	48.7	+1.4	100.3	July 16	—10.5	Jan. 20	21.75	15.86	— 5.89
N. Pac. coast region.										
Olympia	49.5	50.2	+0.7	91.9	June 2	15.1	Jan. 17	54.22	48.13	— 6.09
Portland	52.5	52.6	+0.1	95.0	June 2	15.0	Jan. 19	52.40	38.76	—13.64
Roseburg	52.2	52.7	+0.5	100.0	July 18	22.3	Nov. 16	35.12	35.17	+ 0.05
Mid. Pac. coast reg.										
Cape Mendocino	51.7	51.8	+0.1	85.4	Sept. 9	33.7	Jan. 17	18.78	22.35	+ 3.57
Sacramento	59.4	58.8	—0.6	105.0	July 14	27.5	Jan. 7	23.21	18.17	— 5.04
San Francisco	55.8	56.1	+0.3	93.9	Sept. 8	41.0	†	23.97	20.02	— 3.95
S. Pac. coast region.										
Los Angeles	60.8	61.1	+0.3	98.1	July 15 Aug. 10	32.0	Jan. 2	17.31	17.20	— 0.11
San Diego	60.6	60.5	—0.1	82.5	Aug 29	34.8	Jan. 2	9.08	15.35	+ 6.27

* Two days of March and eleven days of April missing.
† January 2d, 3d, 4th, 8th; February 28th; March 18th.

STATE WEATHER SERVICES.

The following is an extract from the January, 1887, report of the "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The low temperature prevailing throughout the month has rendered January memorable. The average for the state shows a fall of 5°.7 below the normal. There were four cold waves predicted, and all verified with remarkable accuracy, except the one predicted on the 6th. The second occurred on the 10th, the temperature falling from 45° to 20°; the third struck the state on the 18th, when the temperature ranged from 65° to 22°; the fourth reached the state on the 27th, and the temperature fell from 56° to 28°. These cold waves are so accurately predicted now, the people watch the display of the signals with considerable faith and interest.

The precipitation was very nearly normal, 0.26 inch below. There was a slight fall of snow throughout the state on the 1st, 4th, and 5th.

Carrollton furnishes the following note of interest: "At sunrise on the 12th there was an intense fog and no frost. At 9 o'clock the fog suddenly disappeared and the ground at that hour was covered with a thick white frost."

High winds occurred at frequent intervals during the month, and some of them swept with dangerous velocities. Trinity and Tuscumbia report a heavy wind and rain storm on the 13th, attended with hail, thunder, and lightning. The wind blew down fences and trees.

Summary.

Mean temperature, 42°.3; highest temperature, 77°, at Eufaula, on the 31st; lowest temperature, 1°, at Gadsden, on the 3d; range of temperature, 76°; greatest monthly range of temperature, 59°, at Gadsden; least monthly range of temperature, 50°, at Fayette; mean daily range, 15°.7; greatest daily range of temperature, 47°, at Eufaula, on the 19th; least daily range of temperature, 0°, on the 9th, at Centre, Demopolis, Gadsden, and Valley Head, and at Mount Willing, on the 8th.

Mean depth of rainfall, 4.22 inches; mean daily rainfall, 0.14 inch; greatest depth of monthly rainfall, 7.55 inches, at Greenville; least depth of monthly rainfall, 2.38 inches, at Gadsden; greatest daily local rainfall, 5.00 inches, at Fayette, on the 23d.

Average number of days on which rain fell, 6; average number of cloudy days, 10; average number of fair days, 10; average number of clear days, 11.

Prevailing direction of wind, south.

The following extracts are from the January, 1887, report of the "Arkansas Weather Service," Mr. George R. Brown, of Little Rock, director:

Heretofore there has been no reliable data of the climate of Arkansas published, except at Little Rock and Fort Smith, and in a few of the local papers. Persons away from the state have been guided entirely by this. Situated as the state is, with mountains, valleys, and extensive prairies, it is obvious that records kept at a few points can give but a very imperfect idea of the climate of the state. It is now desired to obtain reports from every county. These reports can be made with very little trouble and with little expense. Some few have sent in reports for January, and more have promised to do so for February.

* * * * * *

The highest temperature reported was 74°, at Mount Ida, on the 20th; lowest, —13°, on the 8d. It was —8° on the 9th at Eureka Springs, and —2° on the 2d. At Conway on the morning of the 10th it was 0°, and —6° at Van Buren on the 3d.

The cold-wave flag was up at the 1st of the month for a cold wave which reached the northern part of the state on the 1st, and was general throughout the state from the 2d to 4th; the lowest temperature recorded being —13°, at Mount Ida on the morning of the 3d, —2° at Eureka Springs, and 7° at Little Rock.

Snow was reported on the 2d at Pine Bluff, Mount Ida, and Little Rock. Snow and sleet on the 8th at Pine Bluff, Mount Ida, Conway, Eureka Springs, Little Rock, and Judsonia.

Thunder-storms were frequent in different parts of the state from the 18th to the 25th, especially on the 21st and 22d; these storms were preceded by brisk winds on the 12th and 13th in nearly all parts of the state, and during this time the temperature was generally above the average for the season.

The greatest rainfall reported was on the 22d, Mount Ida, 2 inches, and Little Rock, 1.46 inches.

The following is an extract from the January, 1887, "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, of Springfield, director:

Temperature.—The mean temperature of the state, 20°.1, was 2°.7 below the January normal for thirteen years (January, 1875, 15°.4, being the coldest, and January, 1880, 40°.8, the warmest). The mean for the northern counties was 14°.5; central, 19°.7; and southern, 27°.6. The lowest mean temperature reported was 10°.9, from Belvidere; the highest, 33°.4, from Cairo (a range of 22°.5 in 375 miles of territory, or a fall of one degree for each sixteen and two-third miles of latitude going south).

There were three severe cold waves, on 2–3d, 7th, and 18th; the minimum temperature reported from that of the 2d being 26° below zero; of the 7th, 32° below; and of the 18th, 16° below. The northern counties were affected most by that of the 7th, and the central and southern counties by that of the 2–3d.

The mean temperature was nearly normal, except in the extreme northern counties, where it averaged about 6° below.

The highest temperature reported during the month was 66°.1, on the 20th, from Cairo; the lowest, —32°, on the 7th, from Lacon.

The cold waves predicted, were, as a rule, justified.

Precipitation.—The average precipitation for the state for the month, 1.82, was 0.30 below the normal January precipitation for past ten years. The average for the northern counties, 2.64, was 0.80 above; central, 1.27, was 0.35 below; and southern, 1.39, was 1.41 below.

The remarkable feature of the month was the number of well-defined storm-centres that passed over the state (4th, 13th, 16th, 20th, 22–23d, and 24–25th) and the general deficiency in precipitation, notwithstanding.

A general thunder-storm, accompanied by heavy rain, and in several counties by hail, prevailed on the 22d. Northwest to southwest winds prevailed.

The snowfall was comparatively light, except in the extreme northern part of the state, where it ranged from ten to twenty-seven inches. About six inches fell in the central and three in the southern counties. Frosts were general, except on the 22d.

The following is an extract from the January, 1887, report of the "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The month has been very severe, the temperatures were remarkably low, and the snowfall rather heavy in some localities. There were five periods of general precipitation throughout the state, these occurring from the 3d to the 5th, 10th to 16th, 19th and 20th, the 24th and the 29th. The greatest amount of snow fell during the second of these periods. With these exceptions, fair weather prevailed.

Temperature.—The mean for the month was 0°.1 above zero. At Saint Paul it was 9°.8 below the average of the corresponding month for sixteen years, and the lowest since January, 1875, when it was 2°.3 below zero. At Saint Vincent the mean was 6°.7 below the average, and the coldest month but one since the station was established in 1873, January, 1883, being 0°.7 colder. Duluth was 7°.9 below the average, and La Crosse 4°.8 below. The lowest temperature recorded at any station was 42°.2 below zero on the 6th at Saint Vincent, while on the succeeding day Rochester reported 42°.0 below; Albert Lea and Eau Claire 40° below. The lowest temperatures occurred mainly